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## (54) Connection bridge to floating structure

(57) A bridge for linking a floating structure (8) to a second structure (10), which latter may be fixed or floating, comprises two telescopic bridge sections (6,7), the first of which (6) can be pivotally attached at one end to a deck to permit pivotal movement about horizontal and vertical axes and has lifting attachment means (14) at its outer end, a winch (13) fixed relative to the first bridge section, a pulley block (12) freely movable relative to both bridge sections, and a cable, passing through the pulley block and attached at its ends to the winch and the second bridge section (7) respectively.

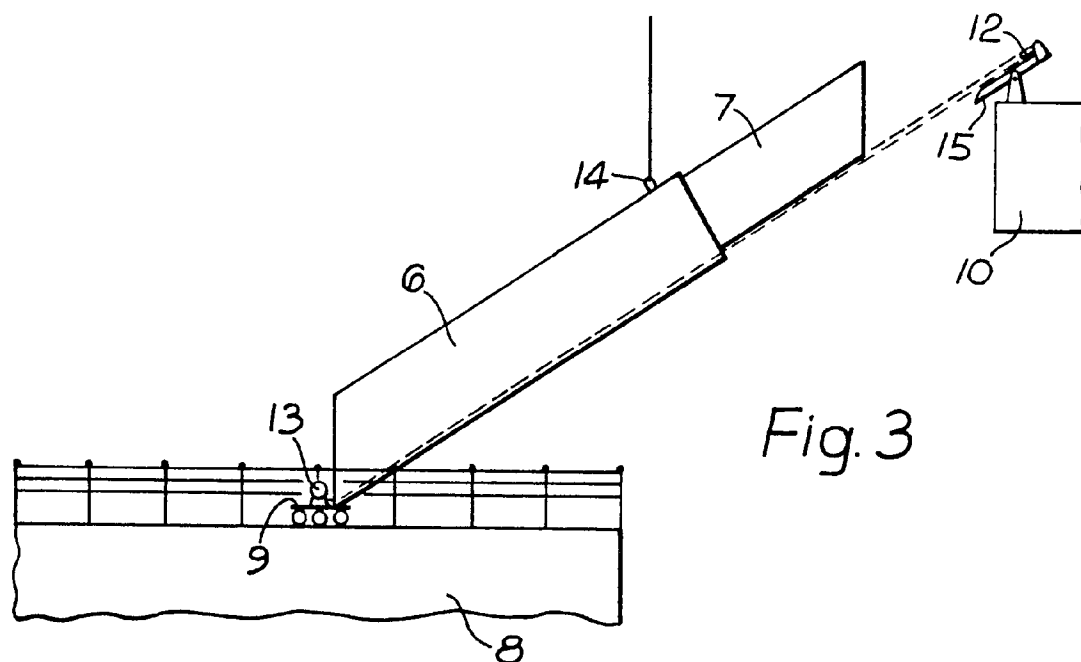


Fig. 3

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Fig. 1

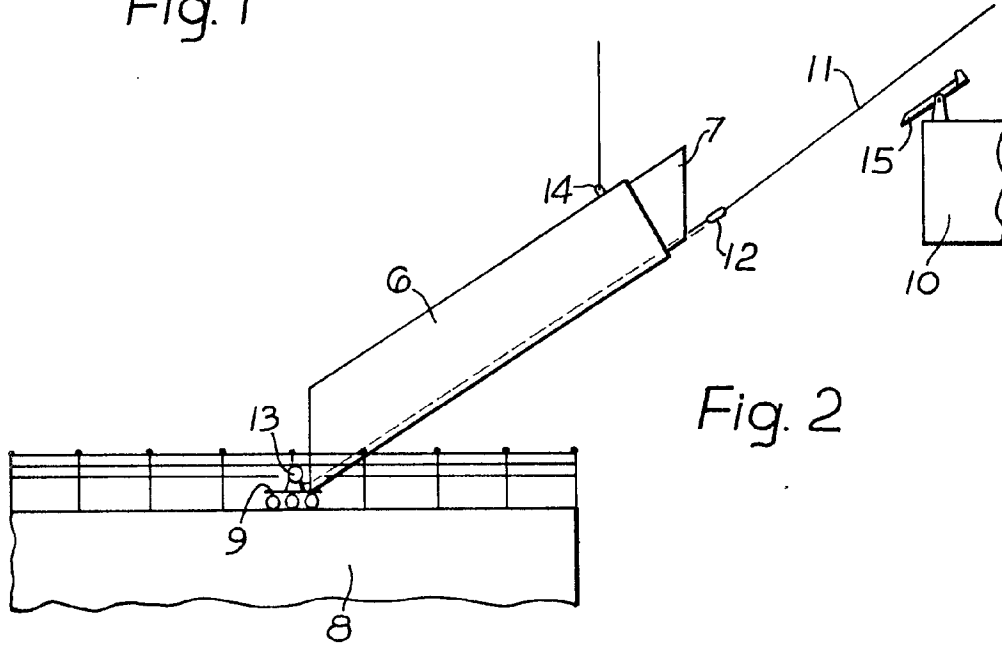


Fig. 2

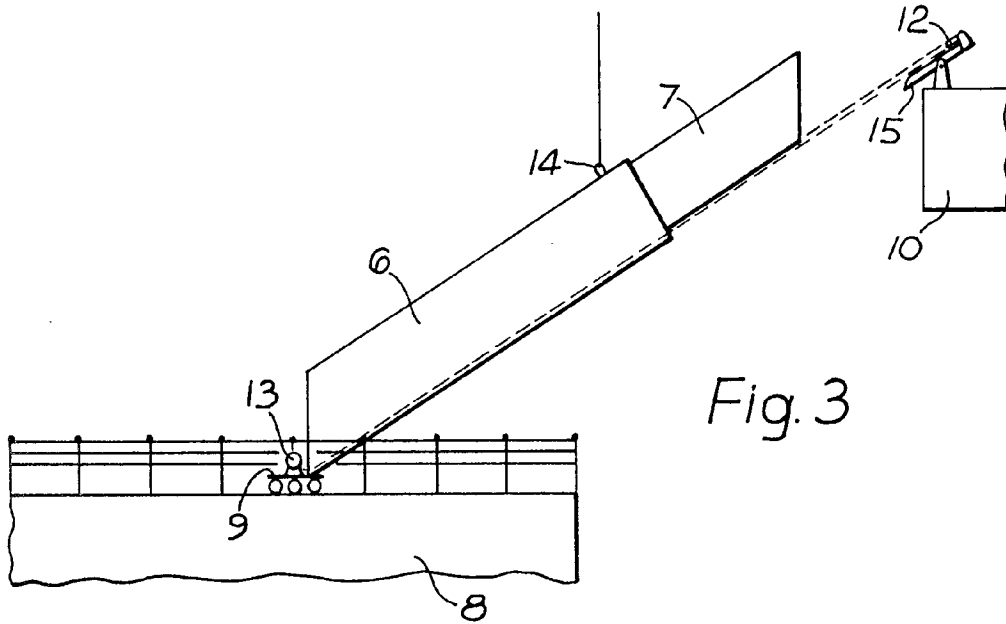
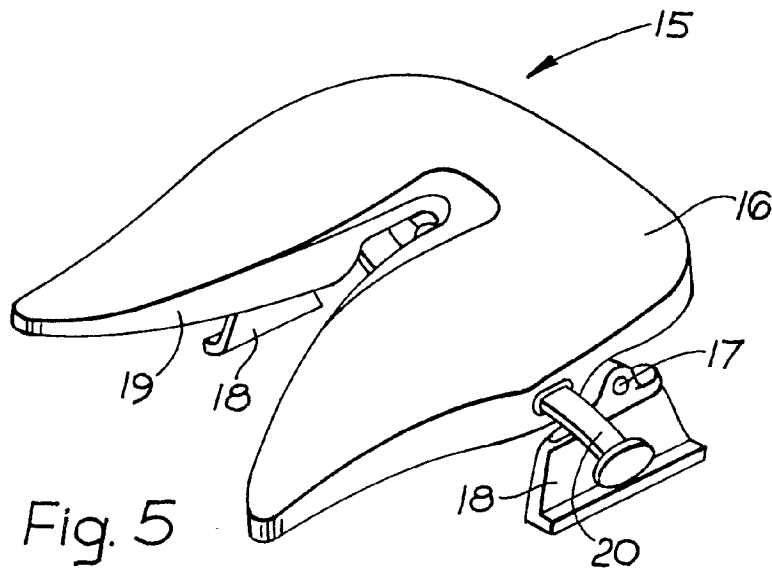
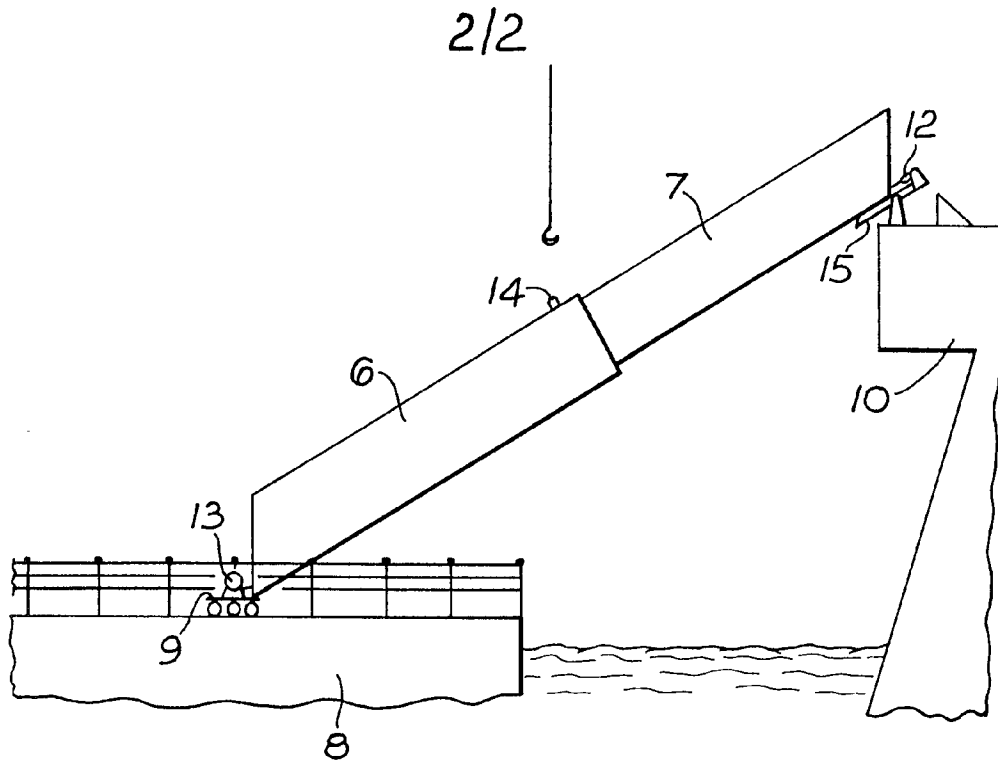


Fig. 3



## SPECIFICATION

### Connection bridge to floating structure

5 The present invention is concerned with the problem of providing a link to a floating structure, for example a ship or semi-submersible off-shore platform, and is a bridge for that purpose.

10 While the need to link a floating structure such as a ship to a fixed base such as a quay or jetty has existed for a long time, the demands of off-shore drilling and gas or oil production have necessitated the development of linking systems able to meet far more stringent requirements, to enable safe operation in extreme conditions of weather and in particular of sea swell. To meet such needs, several relatively complicated, relatively heavy, expensive linking bridges have been produced. Typically, such a bridge is telescopically extendible and incorporates its own dedicated lifting tower and a hydraulic system for extending the bridge. However on off-shore structures, the weight of equipment carried is an important consideration.

There is therefore a real need for a linking bridge which is simpler in construction (and therefore potentially lighter in weight), simpler to operate and maintain and is capable of being produced less expensively than existing such bridges. An object of the present invention is to devise such a bridge.

According to the present invention, a bridge for linking a floating structure to a second structure comprises a first bridge section, pivotal attachment means at or adjacent to a first end of said first bridge section to enable said bridge section to be secured to a deck for pivotal movement about a horizontal and a vertical axis, lifting attachment means at or adjacent to the other end of said first bridge section to enable a crane or other lifting device to be connected thereto, a second bridge section telescopic within said first section, a winch fixedly mounted relative to said first bridge section, a pulley block freely movable relative to both bridge sections, and a cable, passing through said pulley block and being attached at one end to said winch and at its other end to said second bridge section.

By means of the present invention, the need for a dedicated lifting system, exclusive to the bridge, and a hydraulic bridge extension system is avoided.

The link bridge of the present invention may be mounted upon the floating structure or upon a fixed structure. For example, it may be mounted on a service vessel or semi-submersible accommodation structure (a so-called "flotel") to provide the link for personnel to a fixed drilling rig or production platform or to a second floating structure. Alternatively, it may be mounted upon a fixed structure to link the latter to a floating (e.g. semi-submersible)

structure.

The pivotal attachment means at or adjacent to the first end (the "inner" end) of the first bridge section may be a simple turntable about a vertical pivot, the bridge being linked to the turntable about a horizontal pivot, for example a hinge. Alternatively, the attachment means may be more complex and incorporate additional features, such as one or more shock-absorbers and if desired a quick-release feature to enable the bridge to be disconnected in an emergency. Such a quick-release device is described in more detail hereinafter.

At or adjacent to the other end (the "outer" end) of the first bridge section, means are provided for attachment to a crane or other lifting device. Thus lifting eyes or hooks may be mounted on the bridge section, of such dimensions as to receive the hook of a crane. Alternatively, the bridge section may be encircled by lifting strops for the same purpose. No special dedicated crane or lifting device is needed. Almost invariably there will be a crane already upon the adjacent deck for other lifting purposes. For the purposes of the present invention, that crane may be upon the same structure as that to which the bridge is attached (for example a flotel) or upon the structure (for example a production platform) to which the bridge is to provide the link.

Telescopic extension of the bridge of the present invention is achieved using the winch. The winch may be powered by any source readily available, so the bridge does not require the hydraulic power supply used by currently available link bridges. Thus the winch may be driven by compressed air or by electric or hydraulic power as desired. Again, while the winch is preferably provided specifically for operation of the bridge, and may therefore be mounted upon the bridge assembly, for example upon the pivot turntable, it is not essential to use a winch dedicated solely to that purpose.

The cable driven by the winch passes over a pulley block and is secured at its other end to the second bridge section. Extension of the bridge is achieved by mounting the pulley block in the region of the intended "landing area" for the outer end of the bridge upon the structure to which the bridge is to provide access. Thus the pulley block will normally be stowed at or adjacent to the outer end of the bridge (in the retracted position of the latter). When the bridge is to be used, the pulley block may then be transferred to its destination on the second structure using a heaving line thrown from that structure.

In use, the outer end of the bridge may be left free, for example supported on the receiving deck but not attached thereto. Thus it may be provided with wheels or skids to allow it to move over the deck surface in response to relative movement of the structures which it is linking. However, it is preferred to

provide a quick-release attachment on the receiving deck. An important optional feature of the present invention is the provision of a novel form of such quick-release attachment.

- 5 That novel form is a so-called "fifth wheel" coupling such as is widely used for linking trailers of road haulage vehicles to the driving unit. Such a coupling permits relative pivotal movement in both a vertical and a horizontal plane and allows rapid disconnection if the relative movement between the ends of the bridge becomes excessive or if some other emergency requires it.

- 10 The bridge sections themselves are made from a metal which satisfactorily combines resistance to corrosion with lightness and strength. For this purpose aluminium or high-tensile steel is the preferred material.

- 15 The invention will now be further described with reference to the accompanying drawings, wherein:-

- 20 *Figure 1* illustrates, in diagrammatic elevation, one form of personnel bridge according to the present invention, stowed out of use in a retracted condition;

- 25 *Figures 2 to 4* illustrate the bridge of *Fig. 1* in successive positions during erection for use; and

- 30 *Figure 5* is a perspective view, to a greatly enlarged scale, of a quick-release attachment suitable for securing the outer end of a bridge according to the present invention.

- The illustrated personnel bridge is made of aluminium alloy and is constructed in two telescopic sections, a first, outer section 6 and a second bridge section 7 telescopically mounted within the section 6 on guide wheels running on guide rails. Each bridge section is constructed as a conventional open structure but for simplicity is shown in simple outline in the drawings.

- The bridge is shown in retracted, collapsed condition in *Fig. 1*, stowed compactly upon a deck of a semisubmersible service vessel indicated generally by the numeral 8. The rearward or inboard end of the bridge section 6 is mounted on a platform of a swivel trolley 9. This trolley 9 is arranged to run on rails towards and away from a position nearer the edge of the deck of the vessel 8. The mounting of the bridge section 6 on the trolley 9 is such as to allow the bridge to pivot upwards about the trolley and also to swivel about a vertical axis.

- 35 In the drawings, the bridge is shown as intended to link the vessel 8 with a fixed oil production platform 10. When this link is to be established, a heaving line 11 is thrown from the platform 10 and attached to a snatch block 12 at the end of the bridge section 7. A cable, permanently attached to this bridge section, runs over the pulley assembly in the snatch block 12 and then back within the bridge section 6 to a winch 13 mounted on the swivel trolley 9. The cable is represented

by a broken line in *Figs. 2 and 3*.

- The hook from an adjacent crane (not shown) is attached to a lifting eye 14 on the bridge section 6 and the still retracted bridge is lifted until its outer end is roughly aligned with its intended landing area on the platform 10 at mean swell level. The winch 13 is now released and, using the heaving line 11, the snatch block 12 is transferred to the platform 10 and secured there. By operation of the winch, the bridge section 7 is drawn out from within the bridge section 6 (as in *Fig. 3*) until it reaches the platform 10, where it is secured (*Fig. 4*). The snatch block 12 may now be released and, in addition, the crane may now be detached and returned to other duties.

- The method of securing the bridge at the platform 10 is an important feature of the invention. The device used for that purpose is illustrated in *Fig. 5* of the drawings. This device is a so-called "fifth wheel" assembly, originally designed for connecting the trailer section of a road haulage vehicle to its drive unit. As shown, the assembly 15 comprises a saddle 16, pivotally mounted at 17 on brackets 18. The saddle 16 has a large tapered slot 19 designed to receive a king pin (not shown) projecting downwardly from the outer end of the bridge section 7. When the king pin reaches the inner end of the slot 19 it is automatically locked in place. A quick release handle 20 allows the king pin to be disengaged quickly in an emergency.

- Should such an emergency arise, the crane is quickly re-attached to the bridge. The release handle 20 on the assembly 15 is pulled and the bridge will then immediately telescopically retract under gravity. Damage is prevented by the provision of shock absorbers to cushion the gravitational impact of the inner bridge section 7 on the section 6.

- From the above description, it will be seen that the bridge according to the present invention is simple to construct, erect and operate and entails the minimum of associated dedicated equipment. It may therefore be lighter in total weight and less expensive than currently available alternative bridges.

## 115 CLAIMS

1. A bridge for linking a floating structure to a second structure comprises a first bridge section, pivotal attachment means at or adjacent to a first end of said first bridge section to enable said bridge section to be secured to a deck for pivotal movement about a horizontal and a vertical axis, lifting attachment means at or adjacent to the other end of said first bridge section to enable a crane or other lifting device to be connected thereto, a second bridge section telescopic within said first section, a winch fixedly mounted relative to said first bridge section, a pulley block freely movable relative to both bridge sections, and a cable passing through said pulley block and

being attached at one end to said winch and at its other end to said second bridge section.

2. A bridge as claimed in claim 1, wherein said pivotal attachment means comprises a turntable about a vertical pivot, to which turntable said first bridge section is linked about a horizontal pivot.

3. A bridge as claimed in claim 1, wherein said pivotal attachment means incorporates a quick-release feature whereby said first bridge section may be disconnected.

4. A bridge as claimed in any of the preceding claims, wherein said lifting attachment means comprises one or more eyes or hooks on said first bridge section.

5. A bridge as claimed in any of claims 1 to 3, wherein said lifting attachment means comprises one or more lifting strops encircling said first bridge section.

6. A bridge as claimed in any of the preceding claims, wherein said winch is mounted upon said first bridge section or upon said pivotal attachment means.

7. A bridge as claimed in any of the preceding claims, wherein said pivotal attachment means is mounted upon a trolley for linear movement of the latter towards and away from a deck edge.

8. A bridge as claimed in any of the preceding claims, wherein said second bridge section has supporting wheels or skids at its outer end.

9. A bridge as claimed in any of claims 1 to 7, wherein said second bridge section has at its outer end a part of a quick-release device whereby said bridge section may be releasably connected to a deck.

10. A bridge as claimed in claim 9, wherein said quick-release device is a "fifth wheel" coupling.

11. A bridge for linking a floating structure to a second structure, said bridge being substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.